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ABSTRACT

World-Wide Web-based instruction (WBI) has become a powerful tool in recent years. However, WBI utilizing a constructivist theoretical framework has not been explored. A database-driven WBI is the solution for this implementation. Another critical issue is the difficulty encountered in creating, editing, and maintaining WBIs, particularly for those lacking experience in HTML creation. Internet for Teachers, a hybrid televised and Internet graduate level course, is designed with the integration of database-driven instruction. The database manages student publishing, an online grade book, and final projects. This program does not require the instructors or the students to be familiar with Web page creation. (Author/MES)

Database, Collaborative Learning, and Internet

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Abstract: Web-based instruction has become a powerful tool in recent years. However, WBI utilizing a Constructivism theoretical framework has not been explored. A database-driven WBI is the solution for this implementation. Another critical issue is the difficulty encountered in creating, editing and maintaining WBIs particularly for those lacking experience in HTML creation. EMC 598 Internet for Teachers, a hybrid televised and Internet course, is designed with the integration of database-driven instruction. The database manages student publishing, an online grade book, a final project...etc. This program does not require the instructors or the students to be familiar with web page creation.

Introduction

The integration of web-based instruction (WBI) into classrooms has been one of the most important instructional designs to be developed in recent years. Web page design has become the most popular strategy for the delivery of information and communication among educators and students. Creating web pages is not a critical issue for most instructional designs. However, updating and maintenance are the most critical tasks encountered in WBI design. It is very common to see web pages that haven't been updated or maintained. The primary reasons for avoiding updates are that editing HTML codes is time-consuming, and teachers and students are not familiar, or are uncomfortable, with HTML editing. With a database-driven strategy, these two issues can be resolved.

Theoretical Framework

Improving instructional design is not the primary reason to use a database. Conceptually, Constructivism is the theoretic basis of distance education (Jonassen, 1995). Remote access to online databases may facilitate the construction of knowledge. Retrieved information can be used to support positions in a computer conference discussion, for elaboration on a particular topic, or for satisfying personal curiosity. Knowledge construction is fostered through the intentional searching process and by linking information to the learner's own schema. Merely locating information in a database does not necessarily lead to learning. Critical to the knowledge construction process is the articulation of the learner's behavior while performing a database search. This search facilitates and strengthens connections between elements of information and results in higher-order thinking and meaningful learning. A database learning environment requires learners to reflect upon personal knowledge, state learning intentions, and publish ideas to a communal database, thus producing cumulative, progressive results for the group.

A Database-driven Graduate Course

EMC 598 Internet for Teachers is a graduate level course offered through a distance education format utilizing a combination of television and Internet technologies. It utilizes FileMaker Pro, a web-compatible database by Claris Work, to enhance the instructional design. This database-driven design includes student publishing, course management, and final project management.

Assignment Database

The online assignment database is an important aspect of database design. Student publishing has been a very powerful strategy for instructional design. Teachers and students confront the issues of web page creation and maintenance by student publishing on the web. Frequently, teachers and students spend a tremendous amount of time and energy on web page creation, resulting in an inability to focus on the instruction and content. The purpose of student publishing is not learning how to create web pages. When teachers and students are able to achieve the creation of web pages, the student publishing normally is not well organized and is not searchable. It simply provides static information and limited interaction. Web page creation is only the first critical issue in student publishing; the second issue is the FTP (File Transfer Protocol) barrier. Unless teachers and students understand FTP, another learning necessity is created which is not the intention of student publishing.

An online assignment database can be the solution for web student publishing. In this reaction paper assignment database, students compose their assignment on a word processor, then copy-paste the response to the web browser, and submit it, or simply compose the assignment on the browser directly (Fig.1). Students paste their assignment to the proper web fields, such as the title field, the body text field, keyword fields for the title and the target audience, and submit it. When students submit their assignment on the browser, the assignment is converted into an HTML format and a searchable database because the keyword fields are created at the same time. Students and teachers can search the database on the web by keyword, title, author, or subject, etc (Fig.1). This assignment posting doesn't require students and teachers to be familiar with HTML creation and editing. After students have posted their assignments, an editing page allows them to update or edit the assignments they have posted. This design provides students with more interactions through the database, and reduces the maintenance, editing, and updating duties for teachers.

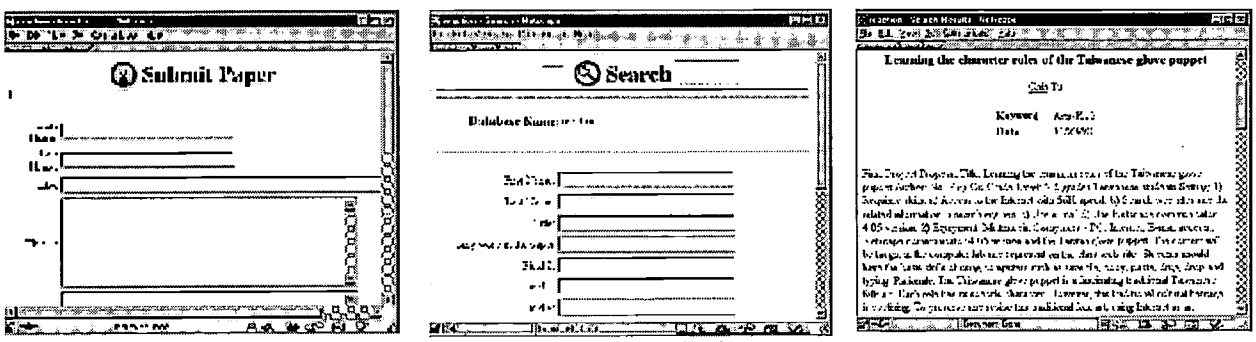

Figure 1: Assignment database

Online Grade Book Database

An online database can be applied to class management; for example, an online grade book can be created. Since the teacher can review student assignments on the web, grading is done on the web as well. Teachers post the grades and feedback on the web without HTML or spreadsheet work. Students' grades and feedback will be available for the students to view when posted by the instructor. The total points earned to that point is also computed after the teacher enters the new grade (Fig.2). When the grades are entered, the students will be notified via an automatic e-mail generating function. Teachers are not required to compose separate e-mails to notify students that their grades have been posted. Teachers also have different formats to view students' grades and feedback, individual student view, and a list of students. This gives teachers an improved, flexible method to manage their class. In the student online grade book, separate from the teachers' grade book, but using the same database, students are required to enter their student ID number to obtain their grades and feedback. This design provides a high level of interaction and personalized information immediately. Students can view their previous grades and feedback, thus obtaining a comprehensive status report.

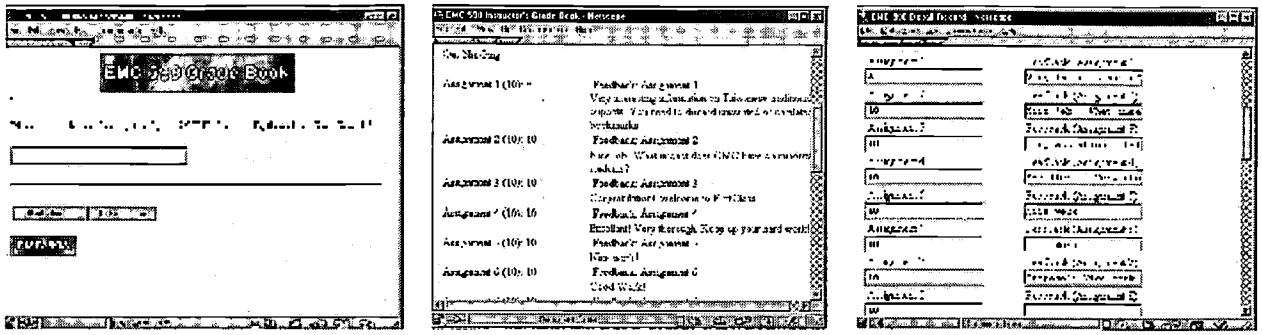

Figure 2: Online Grade Book

Final Project Database

The final project database is the most complicated design in this course. It contains several sub-databases, which provide different functions and management. In this course, students created a web-based instruction and FTP on a web server. The process requires students to post project titles, URL, keyword on subject, and keyword on audience. This process is completed on the web (Fig.3). A web page allows students to view the list of project titles with hot links to the students' web sites. Students are also able to make updates, edit, or change the information they submit. The self-management feature is utilized throughout this database. Peer evaluation is employed in the final project. Students are asked to evaluate five other students' final projects by using an online evaluation form (see fig.). Students can work at their own pace to complete their final project evaluations. This evaluation form contains four criteria. Basically, students follow the criteria to give scores and feedback. In the evaluation form, the project author's name and evaluator's name are required. This gives the instructor the opportunity to determine who has provided evaluations of whom, very important information for the instructor. After finishing the evaluation, students click the submit button to submit their evaluation to the database.

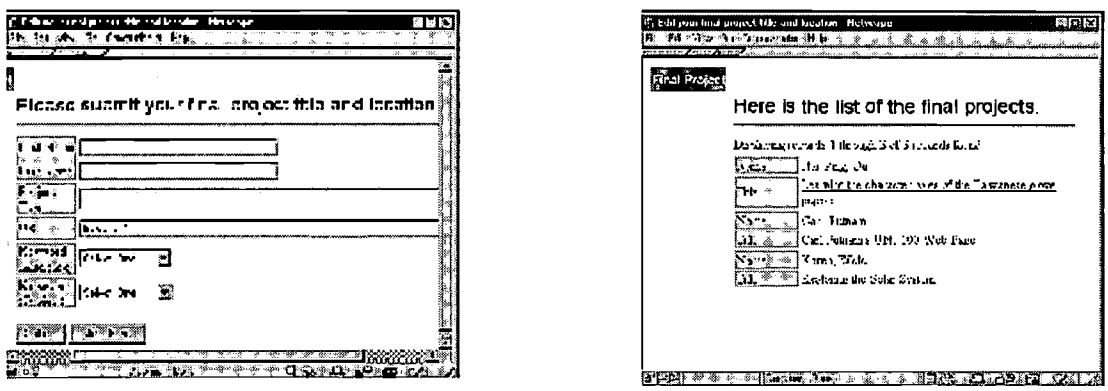

Figure 3: Final Project Database

The second part of the final project database is viewing the evaluations. After students provide their evaluations on other students' final projects, they are able to view their score and feedback right away. Students are able to see all of their evaluations immediately, after they have been submitted. A number with a paragraph, which explains the evaluation status to the students, is located on the top of the page. This gives students a very clear picture of the evaluation status, and they have the opportunity to know how well they are progressing constantly. Eventually, students should be able to see all five evaluations. The results of these evaluations provide scores, feedback and the total score and average score of the five evaluations. The same process is used to view the instructor's evaluations with the total score and average score (Fig.4).

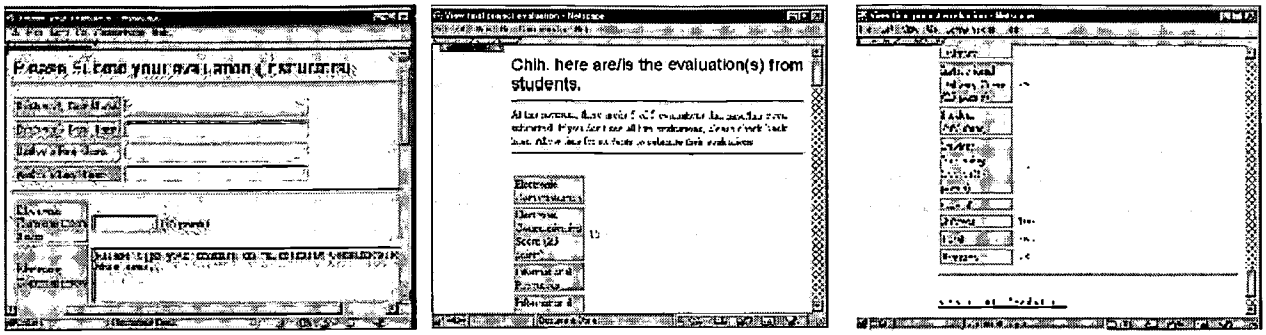

Figure 4: Database Links

The third part of the database is its most powerful element. The scores shown in the student and instructor evaluations are connected to the grade book database. Whenever someone submits a score to the final project database, the students' final project score will be updated immediately with a pre-scripted calculation. For example, the students evaluation is 50% of the final project score and the instructor's evaluation comprises the remaining 50%. When the final project score is updated from evaluations, the students' grades are updated immediately. Since this is a pass/fail course, the students will see their grades with their status. The final-project is an excellent example of self-contained management in a database-driven instruction (Fig.5).

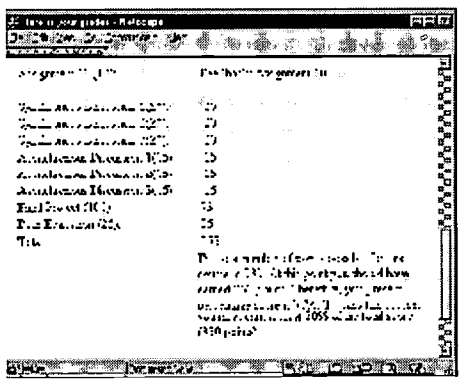

Figure 5: Interactive Database Messages

Security

Security is another reason to use a database. If the database is running on a server, it will be automatically backed-up on a regular basis. In other words, it is safer than on the teacher's computer, which is rarely backed-up. Although the database is running on a web server, a regular backup can be scripted on the FileMaker Pro to backup the important database and files. The access log is another security feature. Whenever the database has been accessed, it will be kept in a log file, which can provide a reference for statistical analysis. If security is extremely important, the database can be scripted to a limited access location, such as an identifying IP address.

Software and Hardware

The database utilized in this class does not require extraordinary software or hardware. The central piece of software, FileMaker Pro 4.0, was installed on a PowerMac 7200/100 with 32 MB RAM and a constant Internet connection, which is not a web server. Two HTML editors, Claris Home Page and Page Spinger, were used to create HTML pages. HTML editor is not required to produce database-driven instruction if the person plans to use codes. However, Claris Home Page provides seamless integration with FileMaker Pro on the HTML creation.

Hardware requirement (FileMaker Pro, 1998) for installation of filmmaker Pro is:

MAC

A Macintosh or Mac OS computer with at least 8 MB of RAM (16 MB or more recommended)
A CD-ROM drive
System 7.1 or later, or Mac OS 8 or later

PC
An Intel-compatible 486/33 PC or higher with 8 MB of RAM (16 MB or more recommended)
A CD-ROM drive
Windows 95 or Windows 98, Windows NT 3.51 or later, Windows for Workgroups 3.11, or Windows 3.1

A constant Internet connection is highly recommended for web publishing. A dial-up connection works but it may not be as efficient and reliable as a constant Internet connection. The number of users is another important issue to examine in terms of hardware requirements. If the database will be accessed by large numbers of users, a more powerful computer is recommended. There were about thirty students in EMC 598, the PowerMac 7200/100 was efficient enough to process all student data, requests and accesses.

Discussion

This database-driven course instruction will be expanded to a full-scaled database-driven course in the future. Course schedules, all assignments, course content, class announcements, joint database with other courses, integration with CGI/Perl will be included in future iterations.

A course schedule database will allow instructors to create, edit, and update course schedules interactively. HTML coding is not required. The schedule will embed with hyper links to make it more interactive.

Assignment database will be applied to all assignments. This will increase student-publishing power and enhance critical thinking and information searches. After several semesters, the database will contain a large amount of searchable information. Students will be able to benefit from this instruction with easy access, not complicated by the necessity of learning more technology.

Course content database will assist instructors in developing and organizing the content of their course(s). Currently, most instructors have their course content in computer files on the their hard drive without any connection. This disorganization creates difficulty for instructors in joining their content. With a content database, instructors can very easily assemble course content, particularly for individual learning instruction. Instructors are aware of the importance of individual learning instruction; but it has never been truly implemented because of the time required. With database design, instructors should be able to design an instruction suited for individual student needs in a timely fashion, a minimum amount of searching would coalesce the content.

A class announcement database is a good tool for class communication. Instructors provide the announcement with a date and post it on the browser. With database scripting, the announcement can be controlled by the instructors' wish. For instance, with minimal scripting work a new announcement will be seen by the date designated by instructors and retired on the date specified. Updating and deletion of the announcements is not required. Instructors can prepare all of the announcements for the entire semester and post them at the beginning of the semester. This feature will help instructors to remember all announcements.

A joint database with other courses will increase the power of database-driven design. It simply expands the size and amount of the database.

With the integration of CGI/Perl or other programming, the database will be more useful, interactive, and secure. However, with programming integration, the concern will be creating more advanced skills for teachers or instructional designers. A database-driven course design doesn't require teachers to have a great deal of familiarity with technology. However, it creates a tremendous amount of work for the database designers or instructors. Filmmaker Pro provides user-friendly interfaces to anyone that has some basic HTML and database design experience. Involvement with web programming creates different issues of design. It is suggested that if someone is planning to integrate a database into their instruction, several questions must be answered in advance: What do I want from a database-driven instruction? Why do I want it? How much do I want it? How much time and support

will I have? Database design can be extremely expensive and frustrating without thorough planning. The concept of a database is planning and taking advantage of it later. Anything involved in redesign or restructure of a database can be very costly.

FileMaker Pro is not the only database available. In terms of the scaleable issue, other products, such as Oracle or Sybase, may provide a more thorough, secure, and scaleable program. However if cost is a major, FileMaker Pro is inexpensive, unlike Oracle or Sybase.

Conclusion

Database-driven course design is a new way to manage and re-examine our instruction designs. Critical thinking, constructing knowledge, learner-center instruction is a new paradigm for instruction design. In the past few years there have been multiple developments in educational technology. Instruction design should take full advantage of database technology to provide a more interactive learning environment.

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